FORM PTO-1390 (Modified) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE
(REV 10-95)

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
1949	
U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	
10/018184	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE 00/01814	JUNE 3, 2000	JUNE 10, 1999

TITLE OF INVENTION

NAVIGATION DEVICE AND METHOD FOR CONTROLLING THE SCALE OF A MAP DETAIL SHOWN ON A DISPLAY UNIT OF THE NAVIGATION DEVICE

APPLICANT(S) FOR DO/EO/US

Ralf DUCKECK

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
    A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☒ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

ET 755 324 583 US

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/018184	PCT/DE 00/01814	1949

20. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☐ Search Report has been prepared by the EPO or JPO **$930.00**
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) **$720.00**
- ☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) **$790.00**
- ☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO **$1,070.00**
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) **$98.00**

	CALCULATIONS PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$890.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	9 - 20 =	0	x $18.00	**$0.00**	
Independent claims	1 - 3 =	0	x $80.00	**$0.00**	
Multiple Dependent Claims **(check if applicable)**.			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$890.00**	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable)**.			☐	**$0.00**	
SUBTOTAL =				**$890.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$890.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).**			☐	**$0.00**	
TOTAL FEES ENCLOSED =				**$890.00**	
				Amount to be: refunded	$
				charged	$

☐ A check in the amount of to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **19-4675** in the amount of **$890.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4675** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

STRIKER, STRIKER & STENBY
103 EAST NECK ROAD
HUNTINGTON, NEW YORK 11743

SIGNATURE

MICHAEL J. STRIKER
NAME

27233
REGISTRATION NUMBER

DECEMBER 10, 2001
DATE

UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: Group: Attorney Docket # 1949

Applicant(s) : DUCKECK, R.

Serial No. :

Filed :

For : NAVIGATION DEVICE AND METHOD FOR CONTROLLING THE SCALE OF A MAP DETAIL SHOWN ON A DISPLAY UNIT OF THE NAVIGATION DEVICE

SIMULTANEOUS AMENDMENT

December 10, 2001

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

S I R S:

Simultaneously with filing of the above identified application please amend the same as follows:

In the Claims:

Cancel all claims without prejudice.

Substitute the claims attached hereto.

REMARKS:

This Amendment is submitted simultaneously with filing of the above identified application.

With the present Amendment applicant has amended the claims so as to eliminate their multiple dependency.

Consideration and allowance of the present application is most respectfully requested.

Respectfully submitted,

Michael J. Striker
Attorney for Applicant(s)
Reg. No. 27233

Claims

1. A method for controlling the scale of a map detail shown on a display unit (50) of a navigation device (10), characterized in that the scale of the displayed map detail is set as a function of a driving instruction issued based on a calculated driving route (220).

2. The method according to claim 1, characterized in that the scale of the map detail displayed is set as a function of the distance of a current vehicle position (210) from a decision point (215) which relates to the driving instruction.

3. The method according to claim 2, characterized in that the scale of the map detail displayed is set in such a way that the route between the current vehicle position (210) and the next decision point (215) are displayed at essentially the smallest possible scale.

4. The method according to claim 2 [or 3], characterized in that the scale of the map detail is set in such a way that both the current vehicle position (210) and the next decision point (215) are shown on the display.

5. The method according to claim 4, characterized in that the scale of the map detail is set in such a way that a predetermined surrounding area around the current vehicle position (210) and/or the next decision point (215) can be shown on the display.

6. The method according to [one of claims 2 to 5] claim 2, characterized in that the scale of the map detail displayed is set essentially inversely proportional to the distance between current vehicle position (210) and the next decision point (215).

7. The method according to [one of claims 2 to 6] claim 2, characterized in that the scale of the current map detail is reduced in preset stages as the vehicle position (210) approaches the next decision point (215).

8. The method according to [one of claims 2 to 7] claim 2, characterized in that when the current vehicle position (210) has reached the decision point (215), the scale of the map detail displayed is set according to the method according to [one of claims 2 to 7] claim 2, with the decision point (216) that is then next.

9. A navigation device with a display unit (50) for displaying a map detail and a control unit (20) for setting the scale of the map detail displayed, characterized in that the control unit (20) sets the scale of the map detail displayed as a function of a driving instruction.

Claims

1. A method for controlling the scale of a map detail shown on a display unit (50) of a navigation device (10), characterized in that the scale of the displayed map detail is set as a function of a driving instruction issued based on a calculated driving route (220).

2. The method according to claim 1, characterized in that the scale of the map detail displayed is set as a function of the distance of a current vehicle position (210) from a decision point (215) which relates to the driving instruction.

3. The method according to claim 2, characterized in that the scale of the map detail displayed is set in such a way that the route between the current vehicle position (210) and the next decision point (215) are displayed at essentially the smallest possible scale.

4. The method according to claim 2, characterized in that the scale of the map detail is set in such a way that both the current vehicle position (210) and the next decision point (215) are shown on the display.

5. The method according to claim 4, characterized in that the scale of the map detail is set in such a way that a predetermined surrounding area around the current vehicle position (210) and/or the next decision point (215) can be shown on the display.

6. The method according to claim 2, characterized in that the scale of the map detail displayed is set essentially inversely proportional to the distance between current vehicle position (210) and the next decision point (215).

7. The method according to claim 2, characterized in that the scale of the current map detail is reduced in preset stages as the vehicle position (210) approaches the next decision point (215).

8. The method according to claim 2, characterized in that when the current vehicle position (210) has reached the decision point (215), the scale of the map detail displayed is set according to the method according to claim 2, with the decision point (216) that is then next.

9. A navigation device with a display unit (50) for displaying a map detail and a control unit (20) for setting the scale of the map detail displayed, characterized in that the control unit (20) sets the scale of the map detail displayed as a function of a driving instruction.

SDCW

#4

UNITED STATES PATENT AND TRADEMARK OFFICE

In re:

Applicant: DUCKECK, R.

Serial No.: 10/018,184

Filed: 12/10/2001

PRELIMINARY AMENDMENT

February 13, 2002

Hon. Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

Preliminarily to the issuance of an Office Action in the above identified application, please amend the application as follows:

Box: DCT

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.
On 2/13/02

In the specification:

Please amend the specification as attached.

In the claims:

Cancel all claims without prejudice.

Add the claims as attached.

Please provide a new abstract of the disclosure as attached.

REMARKS

This Amendment is submitted preliminarily to the issuance of an Office Action in the above identified application. With the present Amendment applicant has amended the specification to bring it in compliance with the requirements of the U.S. Patent Practice.

The original claims have been canceled and replaced with a new set of claims including claim 10, the broadest claim on file, defining an inventive method, claims 11-14 which depend on claim 10, and claim 15, which is the broadest claim defining the navigation device of the present invention.

Also, a new abstract of the disclosure has been submitted.

Consideration and allowance of present is most respectfully requested.

Should the Examiner require or consider it advisable that the specification, claims and/or drawings be further amended or corrected in formal respects in order to place this case in condition for final allowance,

then it is respectfully requested that such amendments or corrections be carried out by Examiner's Amendment, and the case be passed to issue. Any costs involved should be charged to the deposit account of the undersigned (No. 19-4675). Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing this case to allowance, he is invited to telephone the undersigned (at 631-549-4700).

Respectfully submitted,

Michael J. Striker
Attorney for Applicants
Reg. No. 27233

In the specification:

On page 1, line 4, please change the heading "Prior Art" to -- Background of the Invention --.

Please amend first paragraph in lines 6-8 on page 1 as follows:

The invention is based on a navigation device and a method for controlling the scale of a map detail shown on a display unit of a navigation device[, as generically defined by the preambles to the independent claims].

On page 1, in line 23, change the heading "Advantages of the Invention" to -- Summary of the Invention --.

Please amend the last paragraph on page 1 as follows:

By contrast, the navigation device according to the invention and the method according to the invention, [with the features of the independent claims,] make it possible to constantly adapt the scale of the

map detail display on the display unit of the navigation device as a function of driving instructions.

On page 2, in line 21, change the heading "Drawings" to -- Brief Description of the Drawings --.

On page 3, line 13, change the heading "Description of the Exemplary Embodiments" to -- Description of the Preferred Embodiments --.

Amended first paragraph on page 1:

The invention is based on a navigation device and a method for controlling the scale of a map detail shown on a display unit of a navigation device, as generically defined by the preambles to the independent claims.

Amended last paragraph on page 1:

By contrast, the navigation device according to the invention and the method according to the invention, make it possible to constantly adapt the scale of the map detail display on the display unit of the navigation device as a function of driving instructions.

CLAIMS

New claims:

10. A method for controlling a scale of a map detail shown on a display unit of a navigation device, comprising the steps of setting the scale of the map detail displayed as a function of a distance of a current vehicle position from a next decision point that relates to a driving instruction, which has been issued or is to be issued based on a calculated driving route; setting the scale of the map detail displayed in such a way that both the current vehicle position and the next decision point are shown on a display; and displaying the route to be in the current vehicle position and the next decision point essentially at a largest possible scale.

11. A method as defined in claim 10; and further comprising setting the scale of the map detail in such a way that a predetermined surrounding area around the current vehicle position, the next decision point or both can be shown on the display.

12. A method as defined in claim 10; and further comprising the scale of the map display to be essentially inversely proportional to a distance between the current vehicle position and the next decision point.

13. A method as defined in claim 10; and further comprising increasing the scale of the current map detail in preset stages as the vehicle position approaches the next decision point.

14. A method as defined in claim 10; and further comprising setting the scale of the map detail display, when the current vehicle position has reached the decision point, with a decision point which is then next.

15. A navigation device, comprising a display unit for showing a map detail; a control unit for setting a scale of the map detail display, said control unit setting the scale of the map detail display as a function of a distance of a current vehicle position from a next decision point that relates to a driving instruction which has been issued or is to be issued based on calculated driving route, said control unit setting the scale of the map detail display in such a way that both the current vehicle position and the next decision point are shown on a display, said control unit setting the scale of the map detail displayed in such a way that the route between the current vehicle position and the next decision point is displayed essentially at a largest possible scale.

Please provide the following new abstract of the disclosure:

Controlling a scale of a map detail shown on a display unit of a navigation device, is performed by setting the scale of the map detail displayed as a function of a distance of a current vehicle position from a next decision point that relates to a driving instruction, which has been issued or is to be issued based on a calculated driving route; setting the scale of the map detailed displayed in such a way that both the current vehicle position and the next decision point are shown on a display; and displaying the route to be in the current vehicle position and the next decision point essentially at a largest possible scale.

VERIFICATION OF TRANSLATION

I, DAVID CLAYBERG

of 948 15th St., Ste. 4
Santa Monica, CA 90403-3134

declare that I am a certified translator well acquainted with both the German and English languages, and that the attached is an accurate translation, to the best of my knowledge and ability, of the attached German Patent Application.

Signature ______________________ Date December 10.2001
David Clayberg

Navigation Device and Method for Controlling the Scale of a Map Detail Shown on a Display Unit of the Navigation Device

Prior Art

The invention is based on a navigation device and a method for controlling the scale of a map detail shown on a display unit of a navigation device, as generically defined by the preambles to the independent claims.

There are known navigation devices, preferably for use in motor vehicles, which have a display unit on which a road map or a detail of a road map is displayed, which shows the surroundings of the current vehicle position, as well as a marker for the current vehicle position within the map or the map detail.

Such navigation devices with map displays frequently offer the possibility of displaying different scales of the map. In this connection, the respective scale can optionally be adjusted either manually or by means of a zoom function automatically controlled by the navigation device in which the automatic system regularly selects a scale in which both the current vehicle position and the navigating destination are displayed together on the display unit.

Advantages of the Invention

By contrast, the navigation device according to the invention and the method according to the invention, with the features of the independent claims, make it possible to constantly adapt the scale of the map detail displayed on the display unit of the navigation device as a function of driving instructions.

It is thus particularly advantageous that the scale of the map detail is always selected and adapted during travel of the motor vehicle, so that the route to be traveled between the current vehicle position and the next decision point, for example a turn, is displayed completely and at the highest resolution possible on the display unit.

A step by step adaptation of the scale of the current map detail shown on the display unit as the vehicle position approaches the next decision point, which adaptation is carried out in a manner according to one exemplary embodiment of the invention, has the advantage that the display does not have to be updated continuously, which can save a considerable amount of computing power. Furthermore, a step by step scale adaptation is less confusing for the user since he does not have orient himself in relation to a constantly changing map.

The readjustment of the scale of the map detail shown on the display unit of a navigation device according to the invention as soon as the current vehicle position coincides with the decision point permits the user to promptly orient himself through the use of a map display whose scale is readjusted as a function of the distance between the current position and the next decision point.

Drawings

Exemplary embodiments of the invention are shown in the drawings and will be explained in detail in the description that follows.

Fig. 1 is a block circuit diagram of the part of the navigation device according to the invention that is essential to the invention,

Fig. 2A is a flowchart of a first exemplary embodiment of the method according to the invention for adjusting the scale of the map display,

Fig. 2B is a flowchart of a second exemplary embodiment of the method according to the invention,

Fig. 3A shows an example of a first map detail shown on the display unit of the navigation device according to the invention,

Fig. 3B shows a second map detail, and

Fig. 3C shows a third map detail.

Description of the Exemplary Embodiments

Fig. 1 shows a block circuit diagram of a navigation device according to the invention for executing the method according to the invention.

A control unit 20 of the navigation device 10 according to the invention includes both the actual navigation computer as well as a display control unit 52, which among other things, serves to set the scale of a regional map or road map shown on a display unit 50 of the navigation device 10.

The control unit 20 is connected to means 30, 35, 40, which supply data regarding the position, movement direction, and movement state of the vehicle. For example, these can be a rotation speed sensor 30 which, through the integration via the detected rotation speed changes, can aid in orienting the vehicle in which the navigation device is installed in relation to the cardinal points of the compass. Alternatively, a magnetic compass can also be used to determine the orientation of the vehicle. This can also be an odometer 35 which, for example, detects pulses emitted by wheel sensors of an antilock brake system for vehicle braking and, based on the detected number of pulses and a known wheel

circumference, determines a driving distance traveled. Finally, this can also be a GPS (global positioning system) receiver 40 for receiving and evaluating radio signals emitted by GPS satellites, from which the position of the vehicle can be determined. In an alternative embodiment, the driving distance traveled can also be determined solely based on received satellite signals. It is likewise possible for the signals of the GPS receiver to be used to correct the vehicle position that has been determined based on the signals of the other sensors.

In addition, the control unit 20 has a memory 60 connected to it, which stores data of a regional map or road map in digital form. In the current exemplary embodiment, the memory 60 is embodied in the form of a CD ROM drive containing a CD ROM as a data storage device for the map data. However, the memory 60 can also be embodied in the form of a RAM or ROM semiconductor memory.

During the actual navigation process, i.e. while conducting the vehicle driver along a driving route, for example one which has been calculated before the start of the trip, the display unit 50 connected to the control unit 20 displays a map detail which contains the current vehicle position and also the next decision point, e.g. a turning point. In addition, supplementary driving instructions for the vehicle driver can also be displayed, for example in the form of a directional arrow when approaching a decision point, e.g. in the case of imminent turns, and a remaining distance before the turn. Alternatively or in addition to optically displaying driving instructions by means of the display unit 50, an audio output device 55 can also be provided, which can play audible driving instructions, e.g. "turn right after 100 meters", "now follow the highway", and the like.

In addition, the control unit 20 has an input unit 45 connected to it, which has operating elements such as push buttons 47 or other input means, e.g. rotary knobs, for inputting a navigating destination as well as for operating other functions of the device.

The navigation device according to the invention and the navigation method according to the invention function as follows.

After the navigation device 10 is switched on, the sensors 30, 35, 40, namely the rotation speed sensor 30, the odometer 35, and the GPS receiver 40, supply data from which the control unit 20 and/or the navigation computer contained in the control unit determines the current position of the vehicle in which the navigation device according to the invention is installed. Optionally, for the sake of a plausibility test, the control unit also takes into account data from the road map stored in the memory 60 in order to correct the vehicle position calculated based on the sensor data. This type of correction of the determined vehicle position is also known as "map matching".

Before, after, or even during the determination of the current vehicle position, the input of a navigating destination area or navigating destination point is executed in an intrinsically known manner, for example by alphabetically inputting an area or city name and a street name by means of the input unit 45 or for example by marking the destination by means of an indicator that is disposed on a map or road map shown on the display unit 50 and can be controlled using cursor keys.

Next, based on the current vehicle position and the destination input by the user and based on the road map data stored in the memory 60, the navigation computer calculates a driving route from the current position to the input destination.

During the actual destination seeking process, i.e. during the driving of the motor vehicle, depending on a respectively current vehicle position as the vehicle position approaches a decision point, for example an intersection, at which according to the calculated driving route, a turn must be made from a road that is currently being driven, driving instructions are generated, which are announced to the vehicle driver optically by means of the display unit 50 or audibly by means of the audio output device 55.

The function of the navigation device according to the invention and the navigation method according to the invention will be explained below with reference to the flowcharts in Figs. 2A and 2B and in conjunction with Figs. 3A, 3B, and 3C.

The process begins in step 105 with the actual destination seeking process, i.e. after the current vehicle position has been determined by means of the sensors 30, 35, and 40, a destination has been input, and a driving route from the current vehicle position to the input destination has been calculated.

The vehicle is now located, for example, on a first street 250 which, according to the calculated driving route, is to be driven until it intersects with a second street 270. According to the calculated route, a left turn should be made at the intersection, from the currently driven first street 250 onto the second street 270. The next decision point 215, at which the navigation device issues a driving instruction, is consequently the above-mentioned intersection 215 of the first street 250 and the second street 270. Just before the decision point 215 is reached, the navigation device issues a driving instruction, for example in a form with the approximate content "turn left at the next intersection".

In step 110, based on the preset area of the display unit 50 for a map display and the distance of the current vehicle position 210 from the next decision point 215, the display control unit 52 of the navigation device calculates the smallest possible scale at which the map can be shown in which both the current vehicle position 210 and the next decision point 215 can be shown on the display unit 50. The scale is thereby calculated as essentially inversely proportional to the actual distance between the current vehicle position 210 and the next decision point 215 so that the route between the current vehicle position and the next decision point can be shown in as large a format as possible on the display unit 50. Then in step 115, the map with the calculated scale and the current vehicle position 210, as well as the next decision point 215, is shown on the display unit 50. In the current map scale of Fig. 3A, the map only shows the street 250 currently being traveled, two streets 260 and 270 that cross it, including the second street 270, , as well as

the current vehicle position 210 and the decision point 215. The current map scale does not show individual lanes of the streets or how many lanes the streets have.

The process continues with step 120. There, a test is made as to whether the previous next decision point 215 has been passed yet and there is a new next decision point. If not, then the process continues with step 125. There, a test is made as to whether a preset distance has been traveled since the last test. If not, then the process goes back to step 120. The map scale is consequently not changed for the time being. Consequently, as long as the next decision point has not been reached and a preset distance has not been traveled, the map scale that is now current is maintained for the present. Thus in the current exemplary embodiment, the driver is spared having to constantly reorient himself in relation to continuously changing maps. In principle, however, it is entirely conceivable to continuously adapt the map scale to the actual distance between the vehicle position and the next decision point.

The preset distance is preferably variable and dependent on the current map scale. In addition, it can also be a function of the type of road, for example expressway, country road, or city street, or can be a function of the road density in the currently traveled area. When driving on an expressway that has a low density of exits, interchanges, or junctions, the preset distance can be on an order of magnitude, for example, of 5 to 10 kilometers; in the downtown zone, it can be on an order of magnitude of down to 10 meters.

If it is determined in step 125 that a preset distance has been traveled, then the process reverts to step 110 where a new map scale is calculated. Then, the map is displayed at the newly calculated map scale and a map detail is shown which once more contains both the current vehicle position 210 and the next decision point 215.

This situation is shown in Fig. 3B. Since the current vehicle position 210 has come closer to the next decision point 215, a smaller map scale has been selected. The currently smaller map scale permits the depiction of further details such as the several

oncoming lanes 251, 252 of the first street 250, the travel-direction lanes 253 and 254 of the first street 250, a first left-turn lane 255 for turning from the first street 250 onto third street 260 crossing it, and a second left-turn lane 256 for turning from the first street 250 onto the second street 270 crossing it, as well as the fact that the first lane 253 in the travel direction ends shortly after the intersection with the third street 260.

The display of the details described above permits the vehicle driver to orient himself so that in order to continue along the calculated driving route starting from the now current vehicle position 210, he preferably gets into the second lane 254 in the travel direction since the first lane 253 in the travel direction ends after the intersection with the third street. The vehicle driver can also orient himself and see that getting into the far left lane 255 in the travel direction would be useless because it is obviously a left-turn lane 255 for turning onto the third street. Finally, the vehicle driver can see from the current map display that as the first street 250 continues after its intersection with the third street 260, it is clearly provided with a left-turn lane for turning onto the second street 270 to follow the calculated driving route 220.

If it is determined in step 120 of the process that the next decision point 215 on the driving route 220 has been passed, then the process reverts to step 110 where the new calculation of a scale takes place in order to show the map on the display unit 50 as a function of the actual distance between the current vehicle position and the new next decision point 216. Fig. 3C shows this situation. The vehicle has turned left into the second street 270 according to the driving instructions issued by the navigation device and has thereby passed the decision point 215. The now current vehicle position 210 is on the second street 270 just after the passed decision point 215. The new next decision point 216 marks the point at which a fourth street 280 feeds into the second street 270 from the right, where a right turn should be made according to the calculated driving route.

Fig. 2B shows a flowchart of a second exemplary embodiment of the method according to the invention, which will be explained next.

The process begins in step 150 with the actual destination seeking process, i.e. after the current vehicle position has been determined by means of the sensors 30, 35, and 40, a destination has been input, and a driving route from the current vehicle position to the input destination has been calculated.

The vehicle is once again located, for example, on the first street 250, which according to the calculated driving route, is to be followed until an intersection with a second street 270. According to the calculated driving route, a left turn should be made at the intersection from the first street 250 currently being driven into the second street 270. The next decision point 215 at which a driving instruction is issued by the navigation device is consequently the above-mentioned intersection 215 of the first street 250 with the second street 270. Just before the decision point 215 is reached, the navigation device issues a driving instruction, for example in a form with the approximate content "turn left at the next intersection".

Then in step 155, the control unit 20, or the display control unit 52 as part of the control unit 20 of the navigation device 10, initially selects the largest possible scale provided for the map display with which the map can be shown on the display unit 50, containing both the current vehicle position 210 and the next decision point 215. But for the time being, the selected map detail is not shown on the display unit 50.

In another form of this exemplary embodiment, though, the map can also be already shown on the display unit 50 at this point, namely after the largest possible map scale has been set.

Then in step 160, based on the preset dimensions of the area available for a map display on the display unit 50 and the distance of the current vehicle position 210 from

the next decision point 215, a test is made as to whether the map scale can be reduced by a preset factor, provided that both the current vehicle position and the next decision point can be displayed on the map detail then selected. If so, then in step 165, the map scale is reduced by the preset factor, for example halved, so that for example instead of a scale of 1 : 500,000, a scale of 1 : 250,000 is selected. Other preset map scales for a reduction might include, for example, 1 : 100,000, 1 : 50,000, 1 : 25,000, 1 : 10,000, 1 : 5,000, 1 : 2,500, 1 : 1,000. Alternatively, though, a respective reduction by a factor of, for example, approximately 4, v2, or ^{4}v2 is also possible. Then, the process moves to step 160, where a test is once again made as to whether the map scale can be further reduced by the preset factor. In this manner, the map scale is successively reduced as long as both the current vehicle position 210 and the next decision point 215 along the calculated driving route 220 can be shown in the selected map detail.

Finally, if a determination is made in step 160 that it is not possible to further reduce the map scale while simultaneously being able to display both the current vehicle position 210 and the next decision point 215 on one and the same map detail, then in step 170, the map detail is displayed on the display unit 50 of the navigation device 10 at the smallest possible previously determined map scale, at the predetermined resolution, as shown by way of example in Fig. 3A.

Then a test is made in step 175 as to whether the next decision point 215 has been passed in the meantime. If not, then the process reverts back to step 160 where a test is once again made as to whether in the meantime, it is possible to further reduce the map scale by a predetermined measure, while simultaneously being able to display both the current vehicle position 210 and the next decision point 215 at the reduced map scale on the display unit 50. This is the case, for example, if the vehicle on the first street 250 has come a certain distance closer to the next decision point 215 along the calculated driving route 220. Then in step 165, the map scale is reduced by a preset amount. If it is not possible to further reduce the map scale at this point, then in step 170, the map detail is displayed at the reduced map scale, as shown by way of example in Fig. 3B.

Otherwise, if it is no longer possible to reduce the map scale in step 160, then in step 170, the map detail is shown at an unchanged map scale.

If it is determined in step 175 that, as in the situation in Fig. 3B, the next decision point 215 has been passed, then in step 155 the largest possible map scale is once again selected for the time being and then is successively reduced in the manner described above to the smallest scale that permits a simultaneous display of both the current vehicle position 210 and the new next decision point 216.

In another form of the second exemplary embodiment, instead of an abrupt enlargement of the map scale to a maximum value, it can also be respectively enlarged by a preset value until both the current vehicle position 210 and the next decision point 216 can be shown at the smallest possible scale on the same map detail.

Whereas in connection with the description of the two exemplary embodiments, it has always been assumed that the map display must be able to show at least both the current vehicle position 210 and the next decision point 215 simultaneously on the display unit 50, another embodiment can require that a predetermined surrounding area of the current vehicle position 210 and/or the next decision point 215 be displayed, for example a surrounding area on an order of magnitude of approximately 5% to 10% of the total map area. This makes it easier for the vehicle driver to orient himself in the currently driven road network since landmarks possibly at the side of the road or in the immediate vicinity are also indicated on the map display.

Whereas it has been assumed up till now that the map scale is always selected so that it is possible to display both the current vehicle position 210 and the next decision point 215 on the display unit 50, in another embodiment form, this requirement can be eliminated such that for example only the next decision point has to be shown on the map display, otherwise the map scale is selected as essentially inversely proportional to the

distance of the current vehicle position from the next decision point. Fundamentally, the requirement to show the next decision point on the map detail can also be eliminated so that only the current vehicle position is shown in the selected map detail, or even neither the vehicle position nor the next decision point are shown in it. The map scale is then once again selected as essentially inversely proportional to the distance between current vehicle position and the next decision point, optionally even in preset stages.

Claims

1. A method for controlling the scale of a map detail shown on a display unit (50) of a navigation device (10), characterized in that the scale of the displayed map detail is set as a function of a driving instruction issued based on a calculated driving route (220).

2. The method according to claim 1, characterized in that the scale of the map detail displayed is set as a function of the distance of a current vehicle position (210) from a decision point (215) which relates to the driving instruction.

3. The method according to claim 2, characterized in that the scale of the map detail displayed is set in such a way that the route between the current vehicle position (210) and the next decision point (215) are displayed at essentially the smallest possible scale.

4. The method according to claim 2 or 3, characterized in that the scale of the map detail is set in such a way that both the current vehicle position (210) and the next decision point (215) are shown on the display.

5. The method according to claim 4, characterized in that the scale of the map detail is set in such a way that a predetermined surrounding area around the current vehicle position (210) and/or the next decision point (215) can be shown on the display.

6. The method according to one of claims 2 to 5, characterized in that the scale of the map detail displayed is set essentially inversely proportional to the distance between current vehicle position (210) and the next decision point (215).

7. The method according to one of claims 2 to 6, characterized in that the scale of the current map detail is reduced in preset stages as the vehicle position (210) approaches the next decision point (215).

8. The method according to one of claims 2 to 7, characterized in that when the current vehicle position (210) has reached the decision point (215), the scale of the map detail displayed is set according to the method according to one of claims 2 to 7, with the decision point (216) that is then next.

9. A navigation device with a display unit (50) for displaying a map detail and a control unit (20) for setting the scale of the map detail displayed, characterized in that the control unit (20) sets the scale of the map detail displayed as a function of a driving instruction.

Abstract

A method for controlling the scale of a map detail shown on a display unit (50) of a navigation device (10) is proposed, which is characterized in that the scale of the displayed map detail is set as a function of a driving instruction issued based on a calculated driving route (220). In particular, the map scale is set in such a way that both a current vehicle position (210) and a next decision point (215) can be shown on the display.

In addition, a navigation device is proposed, which has a display unit (50) for displaying a map detail, and a control unit (20) for setting the scale of the map detail displayed, in which the control unit (20) sets the scale of the map detail displayed as a function of a driving instruction.

The proposed method and navigation device permits a continuous adaptation of the scale of the map detail shown on the display unit of the navigation device as a function of driving instructions. In particular, the scale of the map detail is selected and adapted during the driving of the motor vehicle in such a way that the route to be traveled between the current vehicle position and the next decision point, for example a turning point, is displayed completely and at the highest resolution possible on the display unit. (Fig. 3A)

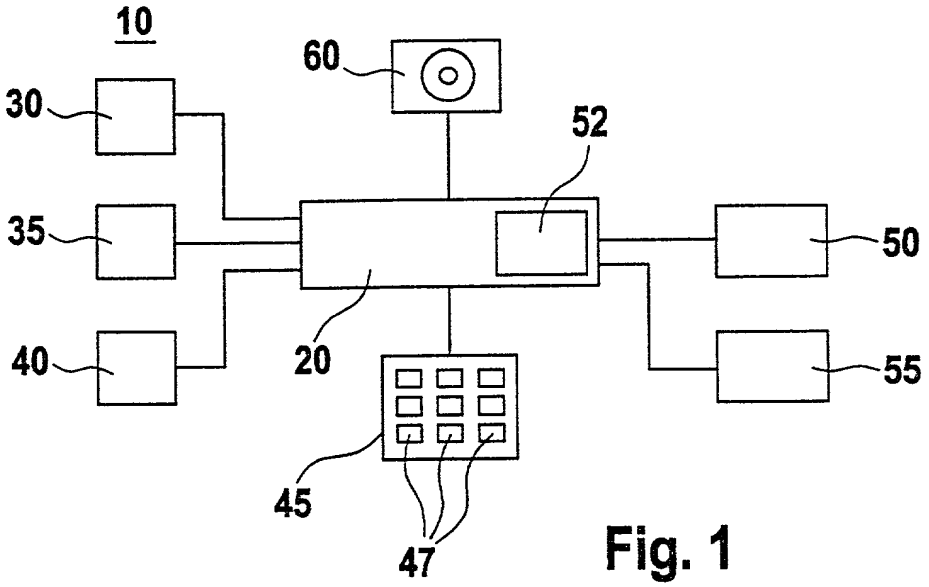

Fig. 1

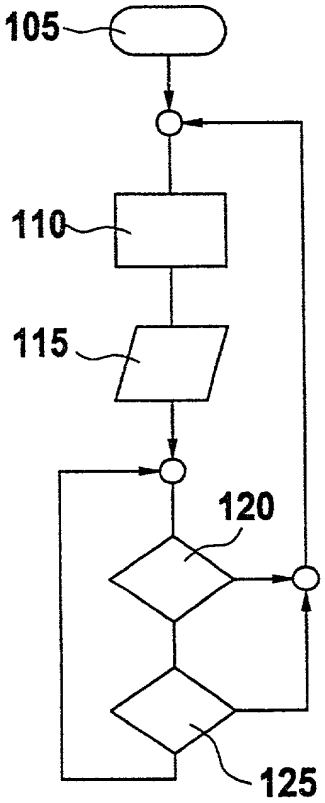

Fig. 2a

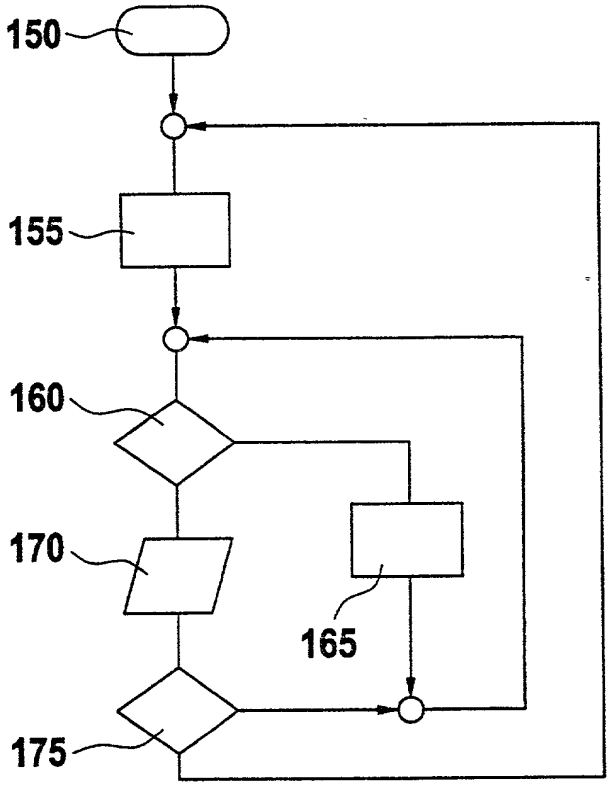

Fig. 2b

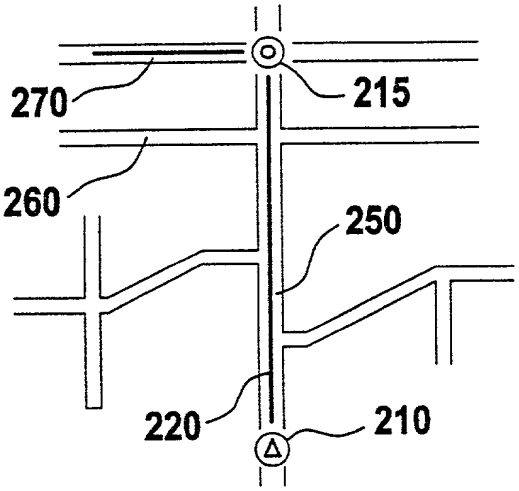

Fig. 3a

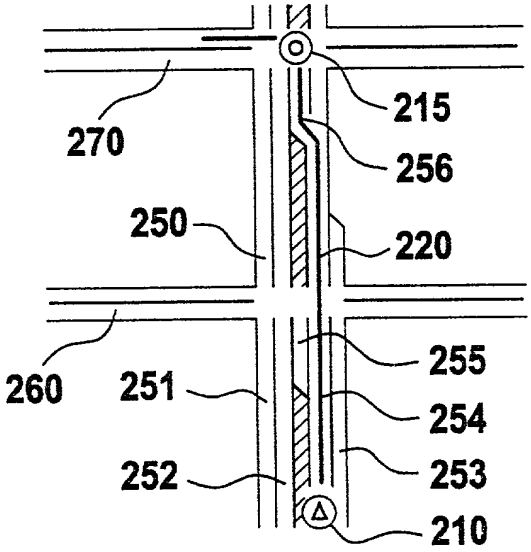

Fig. 3b

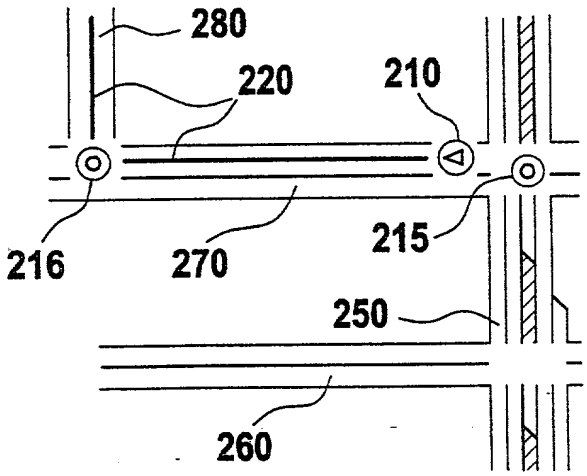

Fig. 3c

#5

DECLARATION AND POWER OF ATTORNEY FOR NATIONAL STAGE OF PCT PATENT APPLICATION

As a below-named inventor, I hereby declare that:

Ralf DUCKECK

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **NAVIGATION DEVICE AND METHOD FOR CONTROLLING THE SCALE OF A MAP DETAIL SHOWN ON A DISPLAY UNIT OF THE NAVIGATION DEVICE** the specification of which was filed as PCT International Application number PCT/DE 00/01814 on June 3, 2000.

I hereby state that I believe the named inventor or inventors in this Declaration to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365 (b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s):			Priority claimed:	
199 26 367.1	GERMANY	JUNE 10, 1999	X	
(Number)	(Country)	(Date filed)	Yes	No
(Number)	(Country)	(Date filed)	Yes	No

As a named inventor, I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statement

may jeopardize the validity of the application or any patent issued thereon.

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Signature:	Date:	Residence and Full Postal Address:
Full Name of Fourth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fifth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
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Full Name of Eighth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Ninth Inventor:	Citizenship:	